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GB 2337891 A GB 2333926 A GB 2328343 A
EP 0897236 A2 WO 97/09813 A1

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(54) Abstract Title

Folder-type mobile phone provided with a double-panel lcd

(57) Two lcd's formed back to back provided in a folder-type mobile phone, mounted within the telephone whereby at least one face of the double-panel lcd is exposed even upon closing the folder.

The lcd's can either be driven in parallel with the same driver or a sensor can detect the position of the folder and generates a control signal to drive the appropriate driver of the visible lcd.

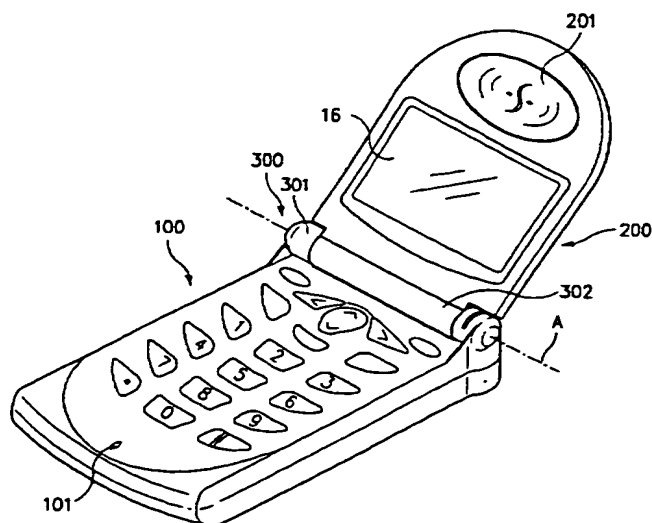


FIG. 1

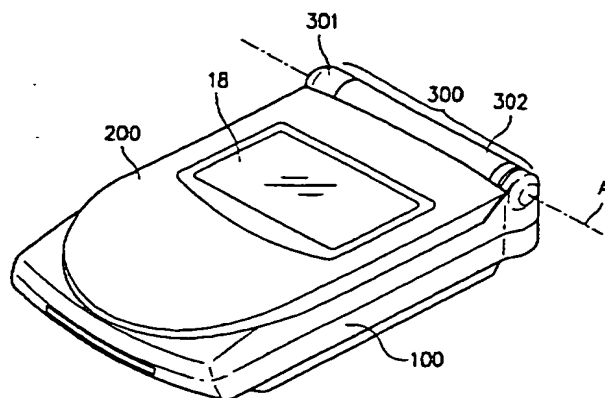


FIG. 2

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

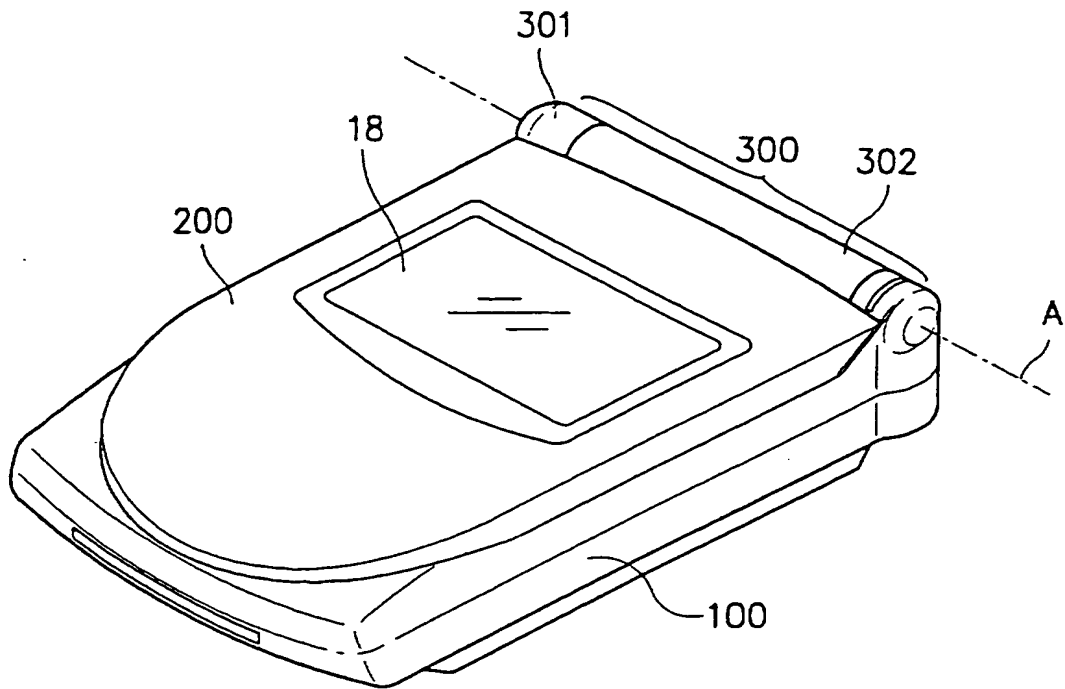
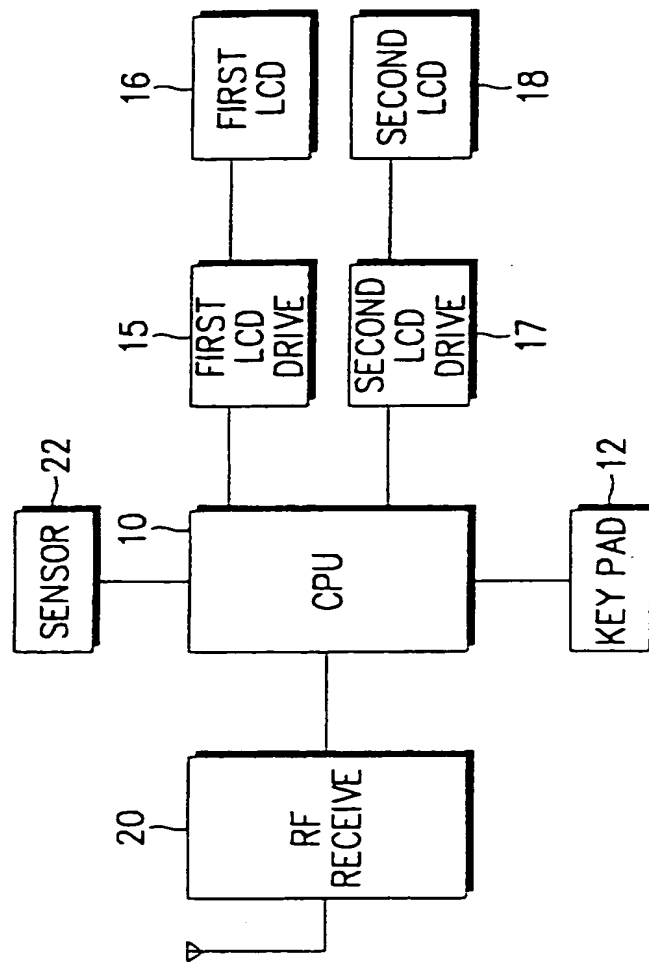


FIG. 2

FIG. 4



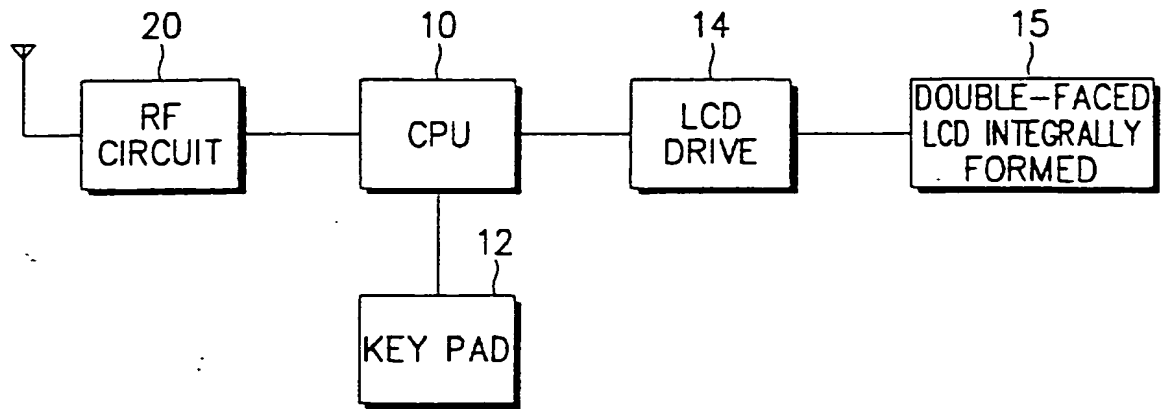


FIG. 6

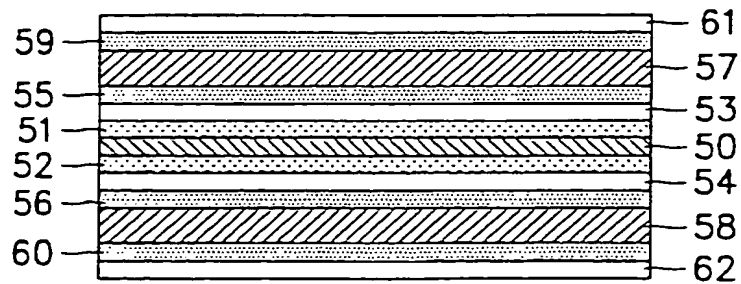


FIG. 7

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a folder-type mobile phone with a two-panel LCD that enables the user to view the operational state of the mobile phone even when the folder is closed.

According to a first aspect of the present invention there is provided a folder type mobile phone comprising first and second LCD panels, and

an LCD drive for driving the first and second LCD panels, wherein

the first and second LCD panels are connected in parallel with the LCD drive and

said first and second LCD panels are mounted on the folder such that at least one of said panels is exposed even when the folder is in a closed position.

In one embodiment of this aspect of the invention the first and second LCD panels are respectively mounted on inner and outer surfaces of the folder. The first and second LCD panels may be arranged in a direct back-to-back arrangement or may be offset from one another. Preferably the folder includes a through aperture in which said first and second panels are mounted in back-to-back relation.

According to a second aspect of the present invention there is provided a folder type mobile phone comprising first and second LCD panels,

first and second LCD drives for respectively driving the first and second LCD panels,

symmetrically on respective opposed sides of a common reflector plate.

In one embodiment of this third aspect of the invention, the first and second LCD panels are connected in parallel
5 to a single LCD drive.

In an alternative embodiment of this third aspect of the invention, the first and second LCD panels are connected to respective first and second LCD drives.

The present invention will now be described more
10 specifically by way of example only with reference to the attached drawings.

BRIEF DESCRIPTION OF THE ATTACHED DRAWINGS

Fig. 1 is a perspective view of the folder-type mobile phone of the invention with its folder opened;

15 Fig. 2 is a perspective view of the folder-type mobile phone of the invention with its folder closed;

Fig. 3 is a block diagram illustrating a circuit for driving a double-panel LCD provided in a folder-type mobile phone according to an embodiment of the present
20 invention;

Fig. 4 is a block diagram illustrating a circuit for driving a double-panel LCD provided in a folder-type mobile phone according to another embodiment of the present invention;

25 Fig. 5 is a flow chart illustrating the process of controlling the circuit of Fig. 4;

Referring to Fig. 3, the CPU 10 controlling the whole functions of the mobile phone generates control signals for driving the LCD. The key pad 12 includes a plurality of alphanumeric keys and various functional keys. An LCD drive 14 is provided to drive the first and second LCD panels 16 and 17 to display information relating, for example, to the operational state of the mobile phone and dialing data in response to the control signals from the CPU 10. An RF circuit 20 modulates the sound signals inputted through the microphone 101 with a radio frequency, and demodulates the RF signals received through the antenna into the sound signals outputted through the speaker 201.

Describing the operation of the mobile phone according to the present embodiment in connection with Figs. 1 to 3, when the folder 200 is opened, and the power key pressed, information concerning the electric field strength received through the antenna is processed through the RF circuit 20, delivered to the CPU 10 to drive the LCD drive 14, which enables the first and second LCD panels 16 and 18 to display the icons representing the antenna and the received electric field strength together with other information such as the present time and date and the specific day of the week. In addition, the functional modes presently set may be displayed on the first and second LCD panels. In this case, the user may view all the information displayed on the first LCD panel 16. However, if the folder 200 is closed, the information may be viewed through the second LCD panel 18.

The embodiment illustrated in Figs. 4 and 5 is different from the previous embodiment in that the first and second LCD panels are respectively driven by first and second

integrally formed with the second LCD panel so as to form a single unit double-panel LCD. Namely, in order to obtain the double-panel LCD 15, the previous embodiments have the first and second LCD panels separately formed while the present embodiment has the first and second panels integrally structured into a single unit. This single unit comprising the double-panel LCD is driven by a single LCD drive 14. Specifically describing the structure of the present double-panel LCD in connection with Fig. 7, the two LCD panels are integrally laid on respective sides of a central reflector plate 50. Sequentially deposited on one side of the reflector plate 50 are a back light plate 51, lower glass plate 53, lower electroluminescent plate 55, liquid crystal layer 57, upper electroluminescent plate 59 and upper glass plate 61. Likewise, similar layers 52, 54, 56, 58 and 60 are sequentially deposited on the other side of the reflector plate 50. Thus, the present embodiment requires only one reflector plate, which is different from the previous embodiments which require two reflector plates. This reduces the thickness and weight of the mobile phone. Of course, the single unit of the double-panel LCD of the present embodiment may be applied in the embodiment of Fig. 4. That is, the first and second LCD panels may respectively be driven by first and second LCD drives in dependance on signals received by the CPU from a sensor for detecting the open or closed position of the folder.

While the present invention has been described in connection with specific embodiments accompanied by the attached drawings, it will be readily apparent to those skilled in the art that various changes and modifications may be made thereto without departing the gist of the present invention.

a controller operative to generate a respective first LCD drive control signal or a second LCD drive control signal in accordance with the said open-state or closed-state signal,

5 wherein said first LCD drive drives the first LCD panel in response to the first LCD drive control signal and the second LCD drive drives the second LCD panel in response to the second LCD drive control signal.

10 5. A mobile phone as claimed in claim 4 wherein the first and second LCD panels are arranged on opposed sides of the folder such that at least one of the panels is exposed even when the folder is in a closed condition.

15 6. A mobile phone as claimed in any of claims 1 to 5 wherein the panel exposed when the folder is in a closed condition is operative to provide a display indicative of the operational state of the phone.

20 7. A folder-type mobile phone including an integral display unit comprising first and second opposed LCD panels wherein the integral display unit is mounted in a through aperture formed in the folder whereby at least one LCD panel of the display unit is exposed even when the folder is in its closed
25 condition.

30 8. A mobile phone as claimed in claim 7 wherein the individual elements of the first and second LCD panels of the display unit are formed symmetrically on respective opposed sides of a common reflector plate.



Application No: GB 9925608.3
Claims searched: 1-3 & 6-11

Examiner: Peter Easterfield
Date of search: 22 December 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK Cl (Ed.Q): H4J (JK)
Int Cl (Ed.6): H04M: 1/02, H04B: 1/38
Other: Online: EPODOC, JAPIO, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2337891 A (NEC) See figs 3A, 3B & 5, with page 5 line 19-22, page 6 line 5-6 & page 8 line 1-10	1,2 & 5
A	GB 2333926 A (MOTOROLA) See figs 9 & 7, with page 13 line 12-18	
X	GB 2328343 A (NEC) See figs 4 & 5, with page 11 line 9-21	1,2 & 5
X	EP 0897236 A2 (NEC) See figs 6A & 7A, col 8 line 48-53	1,2 & 5
A	WO 97/09813 A1 (ERICSSON) See figs 1 & 2	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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